

Practical Test Astronomy Model Answers

- 1. Sundial Length of the rod from end to the board = 8.0 cm (7.5 cm)
- 2. (e) IAU code Oph (We will also accept Her 0.75)
 (f) IAU code Lup (We will also accept Ori 0.75)
- 3. Star Trails
 - (a) UMa (1.5 points), CVn (1 point), Leo, LMi, Dra (0.5 point each)
 - (b) Star Letters **D**, **H**
 - (c) Exposure time = **30 minutes**

Numerical Calculations

Question 1:

(a) As the rod should point to NCP, length of the rod on the ground side should be $x = 20 / \tan(\phi) = 92 \text{ cm},$ where ϕ is the latitude. Thus, the length on the other side is 8.0 cm. (may be 7.5 cm, given plastic board is 0.5 cm thick) (2 points) (1 point) Marking N and S (1 point) (b) winter solstice markings should be on side marked by S Marking local noon shadow line (0.6 points) Symmetric markings for other lines at 30 degrees (0.4 points each) (c) Realising that Summer Solstice markings will be on the other side of the board (1.5 points) Actual markings for Summer Solstice (1.5 points) (1 point) (d) B

Question 3 (c)

Connecting start and end points for trails of a few stars (at least 3) and drawing their perpendicular
bisectors to find NCP(1.5 points)Measuring the angle subtended by these trails at the NCP as 7.5 degrees (6-9 degrees accepted)(1 point)Estimating exposure time as 30 minutes(1.5 point)

7th International Earth Science Olympiad



Practical Test - Astronomy



Theoretical Test Astronomy Model Answers

A1. Atmosphere of Planets

See table: + 0.5 points for each correct marking, -0.2 for each wrong marking.

For winter solstice,	$a_w = 90 - \phi - \epsilon$
For summer solstice (in northern tropical region),	$a_s = 180 - (90 - \phi + \varepsilon)$
	$= 90 + \phi - \varepsilon$
Using these, Inclination of the Earth's axis,	$\varepsilon = 23^{\circ} 26'$
Latitude of Mysore,	$\phi = 12^{\circ} \ 17'$
(1.5 points for each of the four steps)	
	For winter solstice, For summer solstice (in northern tropical region), Using these, Inclination of the Earth's axis, Latitude of Mysore, (1.5 points for each of the four steps)

A3. Pluto and charon:

(a) By Kepler's Third Law,	$a_0^3 = \frac{G(M_{pl} + M_{ch})T^2}{4\pi^2} =$	$=\frac{9GM_{pl}T^2}{32\pi^2}$	(1.5 points)
Hence $a_0 = 1.96 \times 10^7 n$	m	10	(1.5 points)
(b) The distance of barycen	tre from Pluto will be a_0/a_0	'9.	(1 point)
By comparing, a:b = $\frac{d}{d}$	$\frac{a}{b} = \frac{1.965 \times 10^7}{9 \times 1.195 \times 10^6} = 1.83$		(1 points)

(c) One should try to resolve the Pluto-charon system, when the Pluto is closest to the Earth as thats when the angular separation will be highest. (0.5 point)
 Let us say we are using optical wavelengths around 550nm (a slightly better approximation will be to use blue end of visible light around 400 nm)

$$D = \frac{1.22\lambda}{\theta} = \frac{1.22\lambda d_{pl}}{a_0} \approx 15 \, cm \tag{1.5 points}$$

A4. H-R diagram

- (a) Star of Largest Diameter **B** Star of Smallest Diameter **C** (2 points)
 (b) **D** and **F** (1 point)
- (b) D and F
 (1 point)

 (c) A, E and F
 (1.5 points)
- (d) C (1 point)



Student Code:

Statement	Planetof Mass	PlanetRadius of	with respect to Inclination of its Orbital PlaneRotation Axis	Rotation Period	Length of Semi-major axis of the orbit	Eccentricity of Orbit	Total Mass of Satellites	Density of Atmosphere	Water Vapour Percentage	Green House Effect	Magnetic Field Strength	Geothermal Activity
The yearly mean temperatures of planets do not match with their expected black body temperature.				X					X	X		X
Absolute variation in the temperature during the course of one day differs significantly from one planet to another.				X	X			X	X	X		
Absolute variation in the temperature during the course of one year at the equator of the planet differs significantly from one planet to another.			X	X	X	X		X	X	X		
On some planets, there is a large latitudinal percentage variation in temperatures.			X							X		
Mean temperature (averaged over a day) on Earth is different on different days.						X			X			

Question number	Subquestion number	Correct answer	Marks
1	(i)	Α	1
1	(ii)	В	2
1	(iii)	С	2
2	(i)	В	2
2	(ii)	D	2
2	(iii)	D	1
2	(i)	т	1 25
2	(i)	E	1.25
<u> </u>	(!!)	T	1.25
2	(111)	T E	1.25
3		Г Р	1.40
4	-	R	Z

ISEO 2013 Hydrosphere and Atmosphere Theory, Mysuru, India, Correct Answers and marks

Question No.	Subquestion No.	Answer	Answer	Answer	marks
5	-	Α	Ionosphere	Aurorae	0.5+0.5
5	-	В	Mesosphere	Noctilucent clouds	0.5+0.5
5	-	С	Stratopause		0.5+0.5
5	-	D	Stratosphere	UV absorption by ozone	0.5+0.5
5	-	Е	Tropopause	Top of cumulonimbus clouds	0.5+0.5
5	-	F	Troposphere	Cirrus clouds, cumulus clouds	0.5+0.5
6	(i)	Α	-	N ₂	1
6	(i)	В	-	CO ₂	1
6	(i)	С	-	H ₂	1
6	(i)	D	-	02	1
6	(ii)	-	-	2000	1

Question No	Subquestion No.	answer	marks
7	-	D	2
8	-	B and D	1+1
9	-	A and D	2+2
10	Α	Cumulus congestus	0.5
10	B	Cumulonimbus	0.5
10	C	Cirrus	0.5
10	D	Altostratus, altocumulus	0.5
11		See figures below	8 X 0.5 (For each correct arrow 0.5)
12	-	2.18x 10 ¹⁶ m ³	Correct Area 2 Multiply by70% 2 mark Volume 1marks
13	-	0.004 °C	2

14	-	В	2
15	-	В	1

Question no.	Subquestion No	Answer	Marks
16	-	1.26 x 10 ¹⁵ m ³	2
17	-	Left El Nino Right non-El Nino	1+1
18	(i)	+	1
18	(ii)	+	1
18	(iii)	-	1
19		D	2

Total marks



Sea level pressure (hPa)

At F, wind is zero, so no direction can be given



At G wind is zero, so no direction

ISEO 2013 Atmosphere Practical,Mysuru, India, Correct Answers and marks

Question number	Subquestion number	Correct answer	Marks
1	(a)	D	2
1		D	2
1	(D)	D	Z
1	(c)	Final Reading- Initial Reading/Duration	3
1	(d)	Answer to be decided	2
1	(e)	0.2 mm/hr (30/144)	5

Total marks

14



GEOSPHERE WRITTEN TEST ANSWER KEY

Q. N	۱o.	Answer	Marks
1		А	3
2		В	1
3		С	1
4		В	1
5		А	1
6		D	1
7		В	1
8		С	2
9		А	2
10		В	2
11		С	2
12		D	1
13		D	1
14		С	2
15		А	2
16		В	1
17		В	2
18		В	3
19		В	3
20		D	2
21		D	2
22		А	1
23		А	3
24		В	1
25		С	1
26		В	1
27		А	1
28		С	1
29		D	2
30		В	1
31		В	1
32		А	1
33		С	1
34		В	1
35		С	1
36		А	1
37		А	1
38	1	1	
	2	С	1
	3	D	3
	4	В	1
	5	А	
	6	G	

39	1	С	
	2	F	
	3	А	
	4	D	3
	5	В	
	6	E	
40		А	3
41	1	_	
	2	С	
	3	Н	
	4	А	10
	5	В	
	6	D	
	7	J	
	8	E	
	9	F	
	10	G	
42		В	2
43		D	1
44		А	1
45		С	1
46		С	1
47		А	1
48		С	1
49		С	1
50		А	1
		TOTAL	84

ISEO 2013 Hydrosphere Practical, Mysuru, India, Correct Answers and marks

Question number	Subquestion number	Correct answer	Marks
1	(a)	Each parameter for each set plotted correctly – 1 x 4 Neatness and legibility – 1	5
1	(b)	20m SET-1 75m SET-2	2
1	(c)	Α	2
1	(d)	В	4
1	(e)	SET-1 BB SET-2 AS	2

Total marks

15

SET-1

